

## **WOVEN POOL COVER FABRIC PROVIDING WATER DRAINAGE AND 100% SHADE**

### **CROSS-REFERENCE TO RELATED APPLICATIONS**

5                   None

### **BACKGROUND OF THE INVENTION**

                  Broadly, this invention relates to swimming pool covers. More specifically, this invention relates to seasonal-use pool covers which prevent the  
10 accumulation of debris in the pool, yet allow water to pass through freely.

                  There are generally two major classifications of swimming pool covers. One is a seasonal cover intended to protect the pool from the elements during a season or seasons of non-use, typically winter, but possibly including parts of spring or autumn. Such a cover is typically referred to as a winter cover. The  
15 other is a daily-use cover, often used during the pool season (*i.e.*, summer), which may act as a solar heater and/or thermal blanket.

                  It is commonplace for swimming pool owners to install a cover over their swimming pool to protect the pool from leaves and other debris which would otherwise accumulate in the pool when it is not in use, for example over the  
20 winter. Furthermore, pools are typically not drained during the off-season, so the pool cover prevents a person from inadvertently falling into the pool, and drowning or suffering hypothermia from exposure to near-freezing water. One type of pool cover allows any water which might fall onto the cover to drain through to the water below. Also, the cover design is such that if someone did fall upon it, it  
25 would prevent water from seeping through the cover in any quantity sufficient to drown the person.

                  When the pool is closed at the end of the swimming season, the pool water is usually heavily chlorinated. However, during the off-season, light from the sun shining either directly on the pool water, or through the winter cover, causes  
30 algae to grow in the pool water. As result, when it is again time to use the pool, and the winter cover is removed, the water may contain algae which must first be removed. Such removal is both time consuming and expensive since the pool must

again be chemically treated and physically cleaned to kill and remove the algae and render the pool water safe for humans.

Prior art seasonal covers have also been impermeable vinyl sheets, which allow no light, air or water to flow therethrough. While such covers provide a physical barrier to the deposition of debris in the pool, they can be relatively heavy, as much as 12 to 14 ounces per square yard. Such weight can make them difficult to manipulate and store.

In addition to this off-season cover, some pool owners employ another cover during the time the pool is in use, typically called a summer or solar cover. This cover is often a free floating cover made of a thin material, which can be transparent or opaque. Such a cover is floated on the top of the water when the pool is not in use to absorb heat energy from the sun and retain it in the pool water. A further benefit may be prevention of evaporation, thereby obviating or minimizing the need to replenish the pool water.

Clearly, there is an overlap in the functions of the two types of swimming pool covers, for example, the exclusion of debris. Debris, such as leaves, insects and grass clippings can easily find their way into a swimming pool, either on a daily basis or over the 3 to 6 months the pool is "closed" for the winter season.

However, there are several functions and properties of the two types of pool cover that are desirably unique. For example, a seasonal use cover desirably blocks solar radiation from the pool contents. A daily use cover is often more useful when it collects or concentrates solar radiation into the pool and prevents its escape, for example at night or on cloudy days, in order to save on pool heating costs or extend the swimming season. Conversely, a winter cover should provide shade from solar radiation. If not, heating the remaining pool water in a covered pool can lead to the formation and multiplication of various algae. Such heating is possible even when the ambient temperature is cold enough to warrant "closing the pool" for the season, when the pool cover does not provide adequate shade.

Another factor to be considered is the accumulation of water on top of the pool cover, typically from rain or other precipitation. For a summer cover, this is not an issue, as rainwater may fall into the pool without detrimental effect. Conversely, for a seasonal-use cover, accumulated water can present a challenge

to removing the cover at the beginning of the pool-season. A non-permeable pool cover that has been resting on the pool for upwards of six months will usually collect a substantial quantity of debris, including leaves, branches, insects and other matter that is desirably excluded from the pool. Of course, if the pool cover is impermeable, it will also collect water. Water collected on the pool cover coupled with debris collected therein can create an undesirable quantity of dirty water, best prevented from addition to the pool.

Yet another difference is that the daily use cover should be easy to remove and emplace, while this is not a critical factor for a seasonal use cover.

In reviewing the patent literature, include several attempts at producing a light weight water permeable fabric are noted. For example, U.S. Pat. No. 5,887,296, discloses a pool cover having a drain, consisting of one or more layers of a woven thermoplastic polymer, preferably polyethylene. A portion of the pool cover is sealed with a low density polyethylene sealant. The drain portion of the cover is not coated with sealant. The cover may be transparent, translucent or opaque, or have any desired color. The disclosed pool cover is lightweight, about six ounces per square yard.

U.S. Pat. No. 6,286,156 discloses a mesh screen swimming pool cover. An ultra-fine mesh fabric is used as the screen material, and is stretched on a rectangular frame. Individual panels within the frame may be removed separately or the panels may be folded to allow movement of the entire unit as a whole. The ultra-fine mesh fabric is coated with an ultraviolet protective coating to protect against the elements and with a restrictive color to prevent algae and bacterial growth.

U.S. Published Application No. 2002/0116756 discloses a swimming pool cover having reduced friction during sliding movement. The swimming pool cover comprises a flexible fabric sheet of the type capable of being rolled and unrolled over a swimming pool. The flexible fabric sheet comprises either a plastic or cloth material, which material is not critical to the practice of the invention.

While attempts have been made heretofore to produce a lightweight pool cover, the art has not provided a lightweight pool cover that prevents the growth

of algae, prevents debris entry to the pool, yet does not allow water accumulation thereupon.

#### **BRIEF SUMMARY OF THE INVENTION**

5 It is therefore, an object of the present invention to provide a woven pool cover fabric comprising a thermoplastic warp yarn and a thermoplastic fibrillated tape filling yarn providing at least 95% shade.

It is another object of the present invention to provide a woven pool cover fabric that is air and water permeable and which reduces growth of algae in  
10 water containing pools.

At least one or more of the foregoing objects, together with the advantages thereof over the known art relating to lightweight pool covers, which shall become apparent from the specification which follows, are accomplished by the invention as hereinafter described and claimed

15 In general the present invention provides a woven pool cover fabric comprising a thermoplastic warp yarn and a thermoplastic fibrillated weft filling yarn, providing at least 95% shade.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

20 Fig. 1 is an enlarged perspective view of a portion of a woven pool cover product of the prior art; and

Fig. 2 is an enlarged perspective view of a portion of a woven pool cover product of the present invention.

#### **DETAILED DESCRIPTION OF THE INVENTION**

25 The invention provides for a woven fabric that offers the same shade properties as a solid vinyl product but is significantly lighter and allows air and water to pass through. Woven fabrics offered to the pool cover industry now have shade in the 87% to 93% range. A solid vinyl product offers 100% shade. Vinyl  
30 fabrics used in pool cover applications typically weigh from about 12 ounces/yd<sup>2</sup> to about 14 ounces/yd<sup>2</sup>. The solid vinyl product must also have a drain installed or be pumped off to remove the water from its surface. The fabric of the present

invention offers 100% shade but is lighter (8.5 ounces/yd<sup>2</sup>) and allows water to pass through.

With reference to the drawings, a typical woven pool cover characterizing the prior art is indicated generally by the numeral 10 in Fig. 1. The majority of these fabrics are 34x20 construction using a 525F denier flat warp yarn 11, yarn that is .006" (0.152mm) thick x .020" (0.508 mm) wide and a 565 denier round filling or weft yarn 12. Different constructions and monofilament yarns have been used but the shade and water flow does not vary greatly. These fabrics are lighter in weight than solid vinyl covers but do not provide the shade that a vinyl fabric provides.

Woven pool covers according to the present invention are indicated generally by the numeral 15 in Figs. 2 and 3. The cover 15 is of a plain weave construction and employs flat monofilament warp yarns 16 and fibrillated tape filling or weft yarns 18 manufactured from a thermoplastic polymer comprising polyolefins, selected from the group consisting of polypropylene, polyethylene, polybutylene and the like. A preferred polyolefin is polypropylene. Although not as useful as the polyolefins, other thermoplastic polymers can be also be employed such as the polyamides (nylons) and polyesters.

The warp yarns 16 have a denier ranging from about 400F to about 650F, with about 525F being preferred. Dimension-wise, the warp yarns are about 0.004 to 0.009 inches (0.102 to 0.229 mm) thick and about 0.017 to 0.023 inches (0.431 to 0.584 mm) wide, with 0.006 inches (0.152 mm) thick and 0.020 inches (0.508 mm) wide being preferred. The fibrillated fill yarn 18 has a denier range of from about 2000 to 4000, with 3000 being preferred, and is beaten into the fabric as much as the loom will allow to close the openings in the fabric. The fabric is then calendered to a specified air flow to obtain drainage and shade properties when coupled with the specified construction. This allows the fabric to be woven tightly and when calendered it provides adequate shade to reduce algae growth over what the typical woven pool cover fabric allows and, water flow is sufficient for the cover to drain.

The end count of the woven fabric forming the pool cover 15 also has an effect on its performance properties. End counts are typically measured as AA

x BB, meaning AA warp yarns per inch in the machine direction and BB weft yarns in the cross-machine direction. Generally, the warp yarn end count is from about 33 to about 42 per inch, with about 37 to about 39 per inch being preferred and 38 being most preferred. Similarly, the weft or fill yarn end count is from about 11 to about 15 per inch, with about 12 to about 14 per inch being preferred and 13 being most preferred.

Generally, the pool cover fabrics of the present invention have a weight of about 7.8 to about 9.0 ounces/yd<sup>2</sup> with about 8.5 ounces/yd<sup>2</sup> being preferred. Air flow is also important and the pool cover fabrics of the present invention have an air flow specification of about 10 CFM (283 liters/minute) to about 30 CFM (850 liters/minute) with about 15 CFM (425 liters/minute) to about 25 CFM (708 liters/minute) being preferred and about 20 CFM (566 liters/minute) being most preferred. Preferably, the woven pool cover of the present invention is not coated, as are many existing pool covers. In this manner, the pool cover is permeable. Nevertheless, coatings of a nature that do not inhibit the passage of air could be applied to either the yarns or the fabric.

The pool cover 15 is intended to combine the best qualities of a woven mesh fabric and a solid vinyl fabric when used as a pool cover. It is intended to provide adequate shade to prevent algae growth in the pool while it is covered as well as provide drainage without modification and be lighter in weight. Known fabrics that provide adequate shade to prevent algae growth do not offer adequate shade to prevent algae growth and are heavier than the fabric of the present invention.

The pool cover 15 may be used as a winter pool cover, to protect the pool and its contents from harsh winter weather as well as the accumulation of debris in the pool. Further, since a pool may be covered for upwards of six months, the pool may experience several relatively warm and sunny days. Sunlight energy, which passes through the pool cover may promote the growth of algae within the pool. This, coupled with the loss of effective chlorine or bromine used to maintain water clarity, can allow algae to grow. Hence, in order to prevent algae growth, an embodiment of the present invention is a woven pool cover fabric which provides full, or 100%, shade. This means that essentially zero solar radiation incident on

the pool cover is transmitted therethrough. Full shade is desirable in a pool cover in order to prevent the growth of algae, which eases the process of "opening the pool" in that the pool requires less or no cleaning.

Thus, it should be evident that the pool cover of the present invention  
5 is highly effective in preventing algae growth in a swimming pool as well as inhibiting the deposition of unwanted debris in a pool. The invention is particularly suited for covering swimming pools, but is necessarily limited thereto. The pool cover of the present invention can be used separately with other equipment, methods and the like, as well as for the manufacture of other pool maintenance  
10 materials.

Based upon the foregoing disclosure, it should now be apparent that the use of the woven fabric pool cover described herein will carry out the objects set forth hereinabove. It is, therefore, to be understood that any variations evident fall within the scope of the claimed invention and thus, the selection of specific  
15 component elements can be determined without departing from the spirit of the invention herein disclosed and described. In particular, pool covers according to the present invention are not necessarily limited to those having the preferred warp and fill yarns disclosed herein. Moreover, as noted hereinabove, other polymers can be substituted for polypropylene. Thus, the scope of the invention shall include all modifications and variations that may fall within the scope of the attached claims.